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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/714,285	11/14/2003	Edgardo R. Hortaleza	TI-35932 (1962-07400)	2044

23494 7590 10/18/2006

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EXAMINER

IM, JUNGHWA M

ART UNIT PAPER NUMBER

2811

DATE MAILED: 10/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/714,285

Applicant(s)

HORTALEZA ET AL.

Examiner

Junghwa M. Im

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 16-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 16-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-7 and 16-22 rejected under 35 U.S.C. 103(a) as being unpatentable over Cohn et al. (US 6465882), hereinafter Cohn in view of Hambergen (US 5235211).

Regarding claim 1, Fig. 6 of Cohn shows a semiconductor package substrate comprising:
an underlying metal layer [32, 32a, 30, 30a, 30b] including signal traces and substrate bond pad configured for direct interconnections to the semiconductor die; and
a dielectric layer [22] between the first metal layer and the underlying metal layer, including a region of opening to uncover a portion of the underlying metal layer for the direct interconnection to the semiconductor die.

Fig. 4 of Cohn shows most aspects of the instant invention except a first metal layer being free of signal trace to receive a semiconductor die. Fig. 3 of Hambergen shows a semiconductor device comprising a first metal layer [48; Vcc1 layer] being free of signal trace to receive a semiconductor die [30].

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Hambergen into the package substrate of Cohn in order

to have a first metal layer being free of signal trace to receive a semiconductor die to reduce the noise through a ground layer.

Regarding claim 2, Fig. 6 of Cohn shows that the direct interconnection is formed by at least one bond wire [80].

Regarding claim 3, Fig. 6 of Cohn shows that the opening region is free of the first metal layer for receiving the bond wires.

Regarding claim 4, Fig. 6 of Cohn shows that the underlying metal layer comprises a signal layer (col. 3, lines 32-35).

Regarding claim 5, Fig. 6 of Cohn shows the first metal layer comprises a ground plane [32a; col. 3, line 61].

Regarding claim 6, Fig. 6 of Cohn shows that the signal layer is sandwiched between a pair of the dielectric layers [20, 22].

Regarding claim 7, Fig. 6 of Cohn shows that the metal layers comprise copper (col. 2, lines 63-64).

Regarding claim 16, Fig. 6 of Cohn shows a packaged semiconductor device comprising:
an integrated circuit die [75]; and

a package substrate [10], wherein the package substrate further comprises:

a plurality of metal layers [30, 32, 34] separated by a dielectric layer [20, 22, 24]
comprising:

an n metal layer [32, 32a] to which the integrated circuit die is attached;

an n-1 metal layer [30, 30a, 30b] disposed on a side of the n metal layer opposing
the integrated circuit die connected to the die by a plurality of bond wires [80];

an n-2 layer [34]; and
an n-3 layer [36 in Fig. 3].

Fig. 4 of Cohn shows most aspects of the instant invention except an n-th metal layer being free of signal trace to receive a semiconductor die. Fig. 3 of Hambergen shows a semiconductor device comprising an n-th metal layer/top metal layer [48; Vcc1 layer] being free of signal trace to receive a semiconductor die [30].

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Hambergen into the package substrate of Cohn in order to have an n-th metal layer/top metal layer being free of signal trace to receive a semiconductor die to reduce the noise through a ground layer.

Regarding claim 17, Fig. 6 of Cohn shows that the n-1 layer comprises a plurality of signal traces (col. 3, lines 32-35).

Regarding claim 18, Fig. 3 of Hambergen shows a ground plane [32a] is disposed in the n-th metal layer/top metal layer.

Regarding claim 19, Fig. 6 of Cohn shows that the signal traces are sandwiched between a pair of the dielectric layers [20, 22].

Regarding claim 20, Fig. 6 of Cohn shows that one of the pair of the dielectric layers [20] is a substrate core layer.

Regarding claim 21, Cohn discloses that the n-2 metal layer comprises a power plane (col. 4, lines 6-24). Note that Cohn discloses that cavities can be formed in more than one of the dielectric layers, thus exposing one or more conductive layers. And Cohn further discloses that connections for power can be provided in the cavity.

Regarding claim 22, Fig. 4 of Cohn shows that wherein the n-3 metal layer comprises a land layer [36].

Regarding claims 23-24, it is obvious that Fig. 4 of Cohn shows that a pair of the dielectric layers (30, 34) are of similar dielectric constant. Note that Cohn shows that the dielectric layers (30, 34) are of the same insulating layer.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cohn in view of Hambergen as applied to claim 1 above, and further in view of Hashemi et al. (US 6885561), hereinafter Hashemi.

Regarding claim 8, the combined teachings of Cohn and Hambergen show substantially the entire claimed structure except “the dielectric layers comprise bismaleimide triazine (BT).” Hashemi discloses a package substrate comprising dielectric layers made of bismaleimide triazine (BT; col. 4, lines 32-35).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teachings of Hashemi into the package substrate of Cohn and Hambergen in order to have the dielectric layers comprising bismaleimide triazine (BT) to utilize readily available dielectric material.

Response to Arguments

Applicant's arguments with respect to pending claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (571) 272-1655. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (571) 272-1732. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jmi

A handwritten signature in black ink, appearing to read 'Eddie Lee', with a large, sweeping loop at the top and a series of smaller loops and strokes below.

EDDIE LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800